

LISTING OF CLAIMS:

1. (Previously Amended) A wire bonding method, comprising the steps of:  
E forming a semiconductor substrate with a copper (Cu) interconnect material;  
fabricating a copper (Cu) bond pad from the interconnect material;  
depositing a homogenous tantalum (Ta) layer onto the substrate and over the copper (Cu) bond pad;  
patterning and etching the tantalum (Ta) layer, the tantalum (Ta) layer encapsulating the copper (Cu) bond pad; and  
bonding an aluminum (Al) wire to the tantalum (Ta) layer over the bond pad; and  
wherein a portion of the tantalum (Ta) layer forms an intermetallic bond with the copper (Cu) bond pad, and another portion of the tantalum (Ta) layer forms a tantalum aluminide ( $TaAl_3$ ) compound to intermetallically bond the aluminum wire to the tantalum (Ta) layer.

2. (Original) The method of claim 1, wherein the wire is a wire selected from the group consisting of an aluminum wire, an aluminum alloy wire, and an aluminum-coated gold wire.

3. (Original) The method of claim 1, wherein thickness of the tantalum (Ta) layer is controlled such that a portion of the tantalum (Ta) layer bonds with the copper (Cu) bond pad, and another portion of the tantalum (Ta) layer forms a tantalum aluminide ( $TaAl_3$ ) compound.

4. (Original) The method of claim 1, wherein thickness of the tantalum (Ta) layer is between 300 to 1000 angstroms ( $\text{\AA}$ ).

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5. (Original) The method of claim 1, wherein the aluminum (Al) wire is bonded onto the tantalum (Ta) layer by wedge bonding.

6. (Original) The method of claim 1, further comprising the step of performing a heat treatment after the bonding step.

7. (Original) The method of claim 1, further comprising the step of packaging the substrate in a package consisting of a plastic package and a hermetic package.

8. (Original) The method of claim 1, wherein the tantalum (Ta) layer is patterned by a method consisting of negative tone pad masking, photoresist patterning, and photolithography.

9. (Original) The method of claim 1, wherein the substrate is a multi-layered interconnect structure.

10. (Previously Amended) A wire bonding method, comprising the steps of: forming a bond pad made from an interconnect metal on a semiconductor substrate; encapsulating said bond pad with a homogenous metal passivation layer; bonding a wire onto the metal passivation layer, the metal passivation layer including a metal different from the wire;

wherein a portion of the metal passivation layer forms an intermetallic bond with the interconnect metal, and wherein another portion of the metal passivation layer forms a different intermetallic bond with the wire; and

wherein a mechanical and electrical connection is provided between the interconnect metal and the wire, with the metal passivation layer disposed therebetween.

11. (Original) The method of claim 10, wherein the wire is a wire selected from the group consisting of an aluminum wire, an aluminum alloy wire, and an aluminum-coated gold wire.

12. (Original) The method of claim 10, wherein the passivation layer is a tantalum (Ta) layer.

13. (Original) The method of claim 10, wherein the wire is bonded onto the passivation layer by wedge bonding.

14. (Original) The method of claim 10, further comprising the step of performing a heat treatment after the bonding step.

15. (Original) The method of claim 10, wherein the substrate is a multi-layered interconnect structure.

Claims 16-20 (Canceled).

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21. (Previously added) The method of claim 1 wherein the step of depositing the tantalum (Ta) layer encapsulates the copper (Cu) bond pad.

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